

# *Adapting to Climate Change in Alaskan Communities*

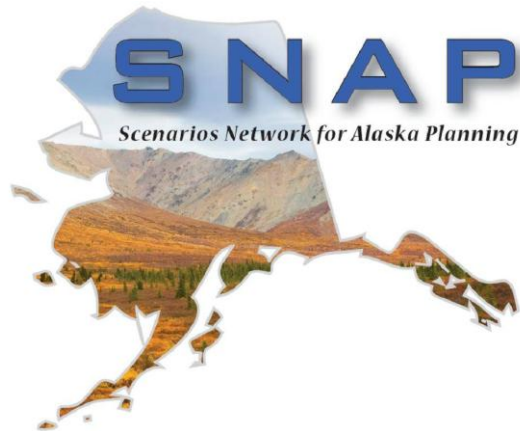
Sarah F. Trainor

Coordinator, Alaska Center for Climate  
Assessment and Policy

Stakeholder Liaison, Scenarios Network for  
Alaska Planning



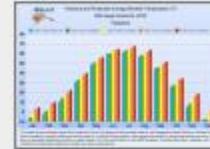
# Climate Vulnerability & Adaptation Resources and Tools





## Spotlight

### Snap Delivers Climate Change Data to Public's Fingertips



Every community in Alaska now has access to climate change data focused on their own backyard, thanks to a new, user-friendly tool created by UAF's Scenarios Network for Alaska Planning... [read more »](#)

Objective data for people who make policy, management, and economic decisions  
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Welcome to SNAP, the Scenarios Network for Alaska Planning. We are a collaborative organization linking the University of Alaska, state, federal, and local agencies, and NGOs.

**Our mission is to provide timely access to management-relevant scenarios of future conditions in Alaska.**

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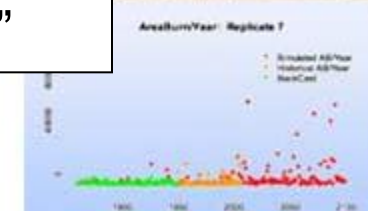
- Climate change projections in Google Earth format
- SNAP fact sheets and documents
- Governor's Subcabinet on Climate Change
- BLM Eastern Interior Management Area Climate Change Report.pdf (25.0MB). Also available in a low resolution version.

## News Highlights

- Snap Delivers Climate Change Data to Public's Fingertips



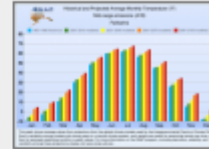
Click on "Community Charts"





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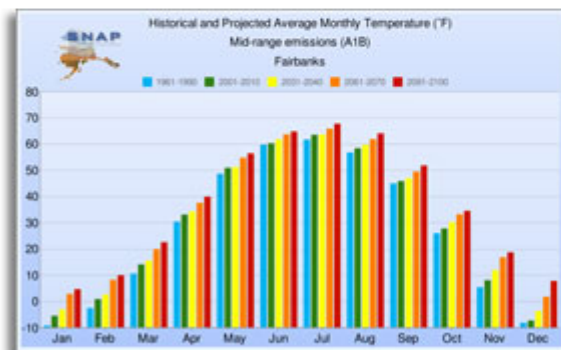
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## Community Charts

Select your community and compare projected future climate results under three scenarios of future greenhouse gas emissions.



## Choose Your Community

Filter the list:

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<http://www.snap.uaf.edu>

[Temperature](#)[Precipitation](#)

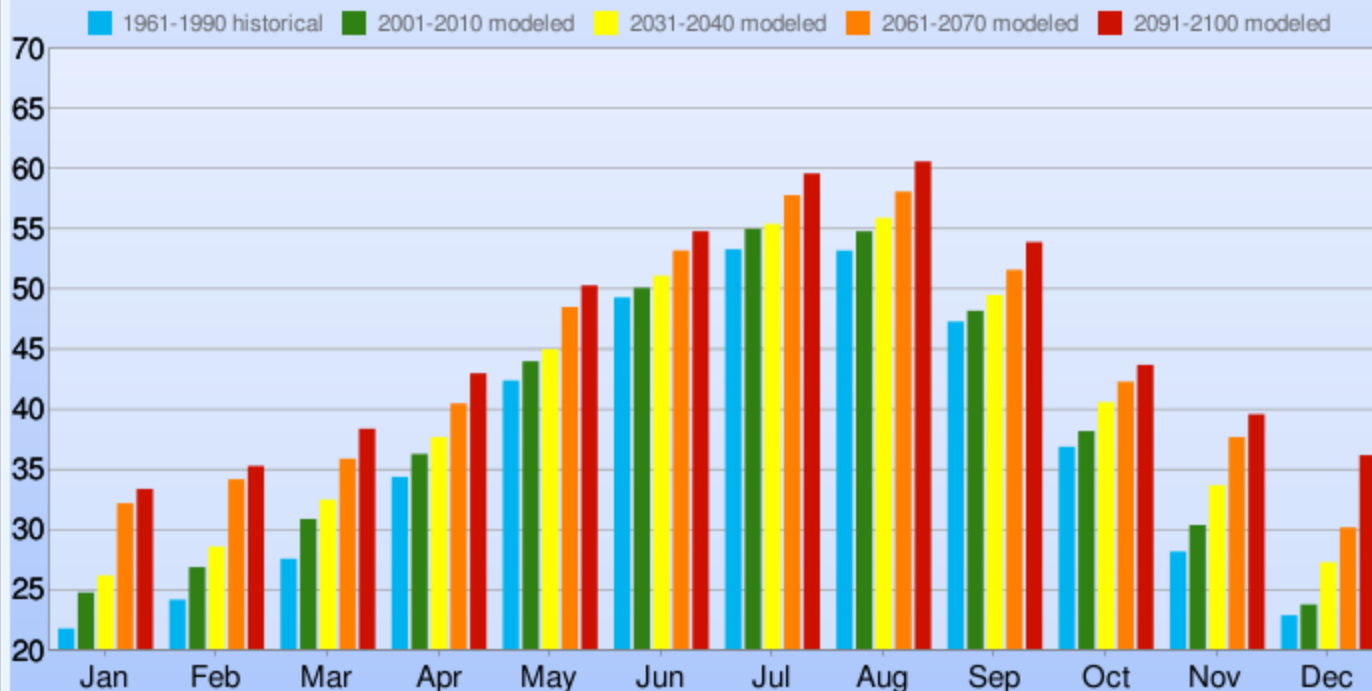
### Future Greenhouse Gas Emissions:

[Low](#)[Medium](#)[High](#)[Details](#)[Print](#)[Download](#)

#### Historical and Projected Average Monthly Temperature (°F)

Mid-range emissions (A1B)

Homer



This graph shows average values from projections from five global climate models used by the Intergovernmental Panel on Climate Change. Due to variability among models and among years in a natural climate system, such graphs are useful for examining trends over time, rather than for precisely predicting monthly or yearly values. For more information on the SNAP program, including derivation, reliability, and variability among these projections, please visit [www.snap.uaf.edu](http://www.snap.uaf.edu).

[Temperature](#)[Precipitation](#)

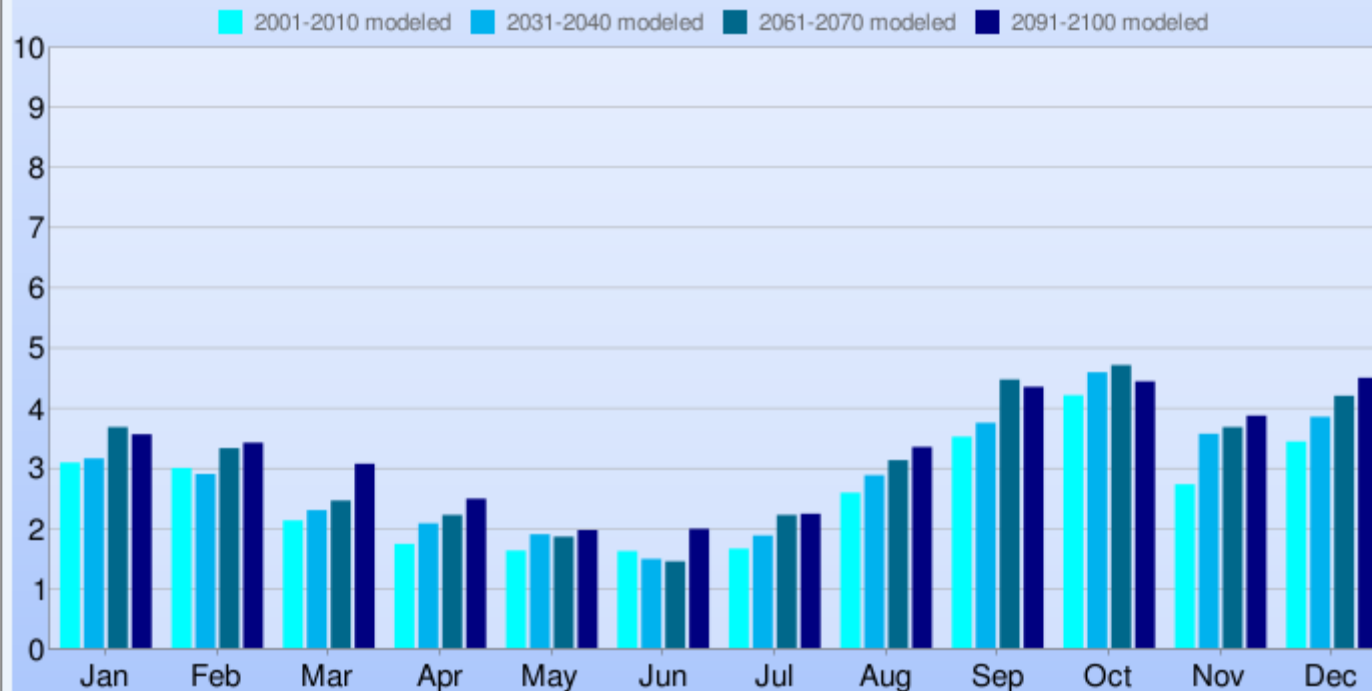
### Future Greenhouse Gas Emissions:

[Low](#)[Medium](#)[High](#)[Details](#)[Print](#)[Download](#)

#### Projected Average Monthly Precipitation (inches)

Mid-range emissions (A1B)

Homer



This graph shows average values from projections from five global climate models used by the Intergovernmental Panel on Climate Change. Due to variability among models and among years in a natural climate system, such graphs are useful for examining trends over time, rather than for precisely predicting monthly or yearly values. For more information on the SNAP program, including derivation, reliability, and variability among these projections, please visit [www.snap.uaf.edu](http://www.snap.uaf.edu).





## Spotlight

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A new report on statewide hydrology is now available, based on a study by The Wilderness Society in conjunction with SNAP. To download the report, look under Reports in the menu on the left... [read more »](#)

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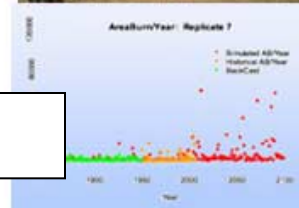
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- Climate Change Impacts on Water Availability in Alaska

## Click on "Web-based Maps"

- Climate Change Summary Reports Available for Parks and Refuges
- New Analysis of Validity of SNAP Climate Models

[News Archive »](#)





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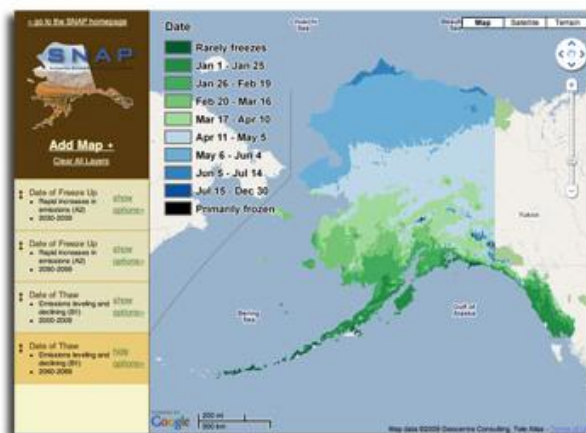
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### Web-based Maps

Open SNAP's Map Selection Tool for quick and easy access to a wide range of climate projections for the state of Alaska at a 2km resolution. You can view, print and save the maps to your computer.



### Other Maps

We also have more maps available in [Google Earth](#) and [GIS formats](#).

**Click on “Open SNAP’s Map Selection Tool”**



[go to the SNAP homepage](#)



**Add Map +**  
[Clear All Layers](#)

Map Satellite Terrain



**Select a Map Layer:**

Length of Growing Season	<a href="#">view details</a>
Date of Freeze Up	<a href="#">view details</a>
Date of Thaw	<a href="#">view details</a>

[← Previous](#)   [Next →](#)   [Cancel](#)

**Details for Length of Growing Season - Mozilla Firefox**

<http://www.snap.uaf.edu/select-maps/details.php?field=layerField>

### Length of Growing Season

**Number of days between spring thaw and autumn freezeup.** Across the state, length of summer season is projected to increase, and winters conversely are projected to shorten. These maps depict the time interval between spring thaw and autumn freeze-up, as defined by the time at which mean temperatures cross 0°. *Note that this time span does not correspond to growing season for crops.* These data were derived by interpolating daily temperature values based on linear temperature ramps between monthly means. Mean values were assumed to occur in the middle of each month. Areas which do not experience mean temperatures below freezing appear in dark brown on these maps. Striking increases in growing season length are projected across the southcentral, interior, and northern regions of the state.

Done

## Select an Emissions Scenario:

> <b>Mid-range emissions (A1B)</b>	<a href="#">view details</a>
Rapid increases in emissions (A2)	<a href="#">view details</a>
Emissions leveling and declining (B1)	<a href="#">view details</a>

← Previous      Next →      Cancel

Bering  
Sea

Gulf of  
Alaska

## Select a Decade:

2000-2009	<a href="#">view details</a>
2030-2039	<a href="#">view details</a>
2060-2069	<a href="#">view details</a>
2090-2099	<a href="#">view details</a>

← Previous      Next →      Cancel

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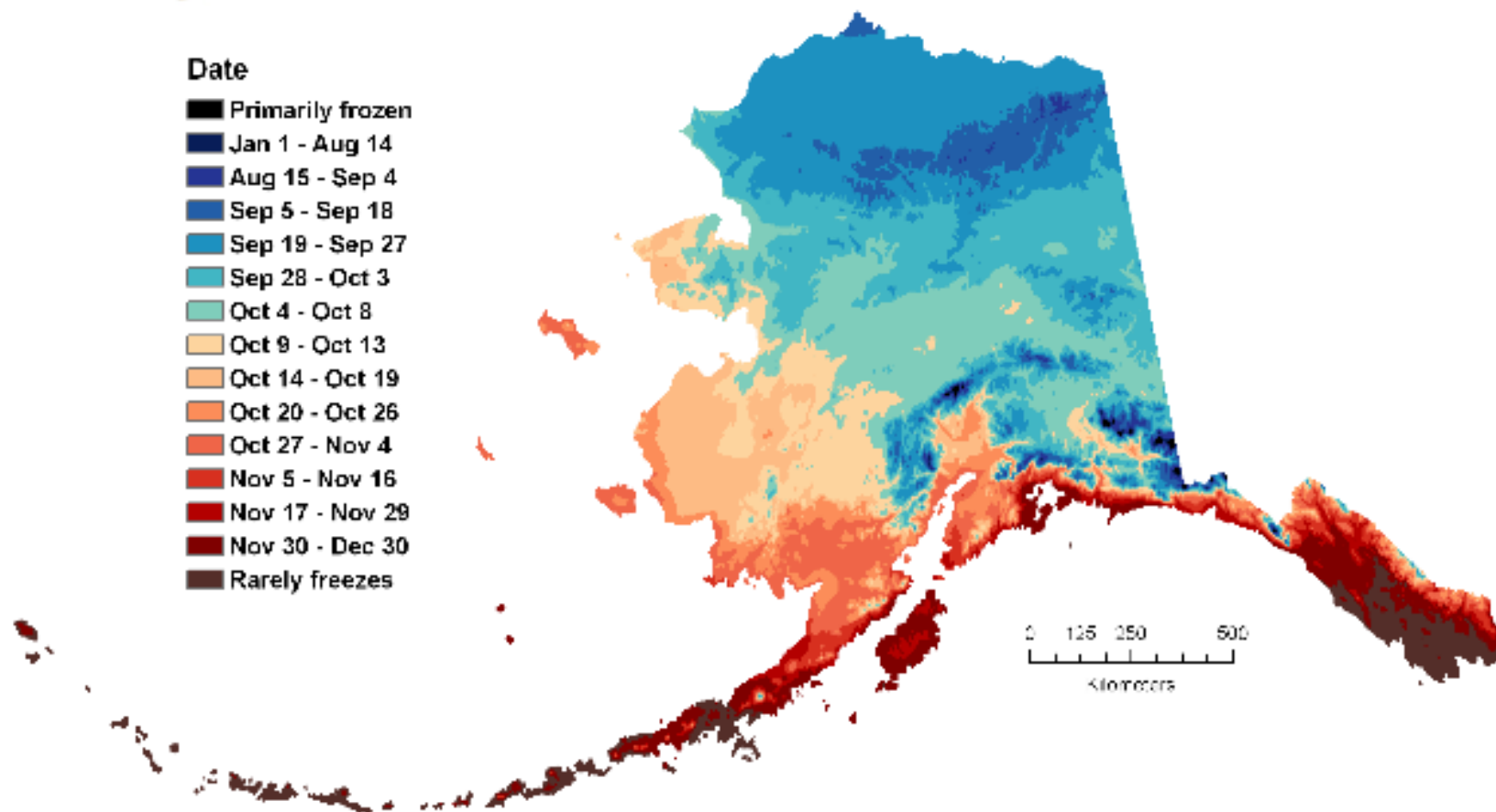
Yukon



**Day of Freeze**  
Mid-Range Emmissions (A1B)  
2000-2009

**Date**

- Primarily frozen
- Jan 1 - Aug 14
- Aug 15 - Sep 4
- Sep 5 - Sep 18
- Sep 19 - Sep 27
- Sep 28 - Oct 3
- Oct 4 - Oct 8
- Oct 9 - Oct 13
- Oct 14 - Oct 19
- Oct 20 - Oct 26
- Oct 27 - Nov 4
- Nov 5 - Nov 16
- Nov 17 - Nov 29
- Nov 30 - Dec 30
- Rarely freezes



[go to the SNAP homepage](#)



**Add Map +**

[Clear All Layers](#)

Date of Freeze Up

[hide](#)

- Mid-range emissions (A1B)
- 2000-2009

[options»](#)

Date of Freeze Up

[show](#)

- Mid-range emissions (A1B)
- 2090-2099

[options»](#)

Date

- Primarily frozen
- Jan 1 - Aug 14
- Aug 15 - Sep 4
- Sep 5 - Sep 18
- Sep 19 - Sep 27
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- Nov 5 - Nov 16
- Nov 17 - Nov 29
- Nov 30 - Dec 30
- Rarely freezes

POWERED BY  
Google

50 mi  
100 km

Map Satellite Terrain



+

0

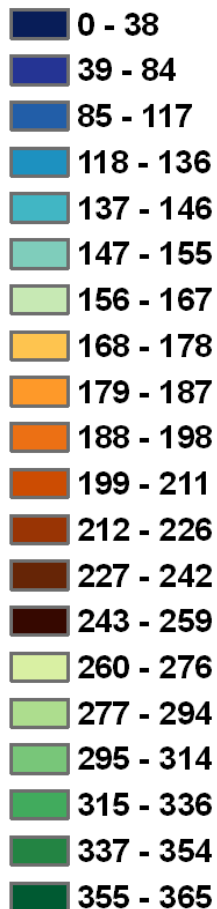
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Map data ©2009 Tele Atlas - [Terms of Use](#)

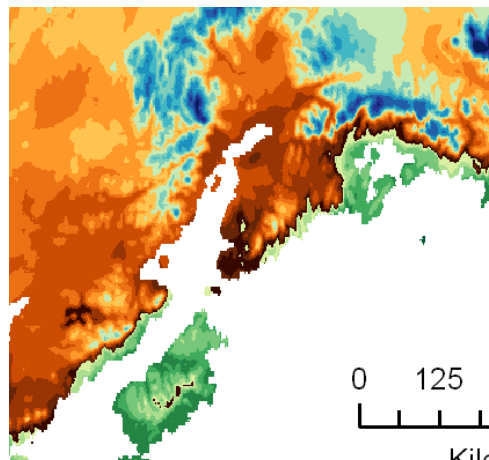
Done



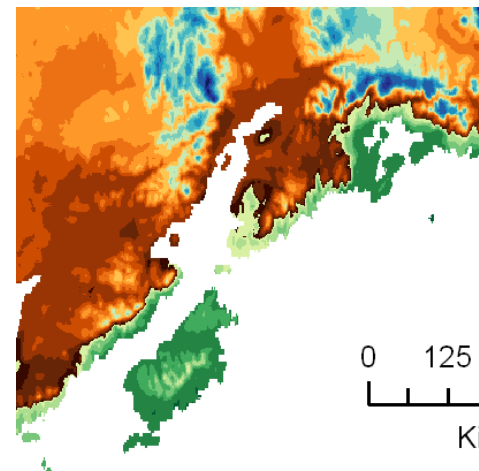
### Number of Days



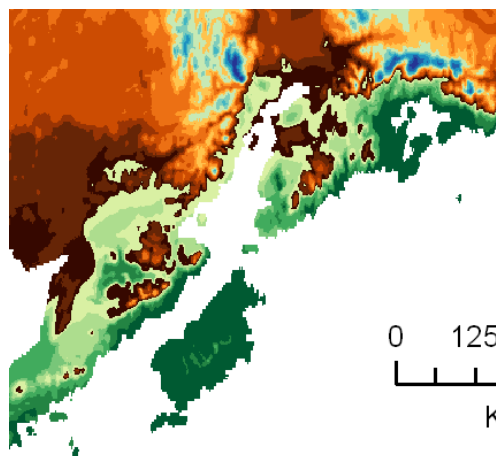
**Length of Growing Season**  
Mid-Range Emissions (A1B)  
2000-2009



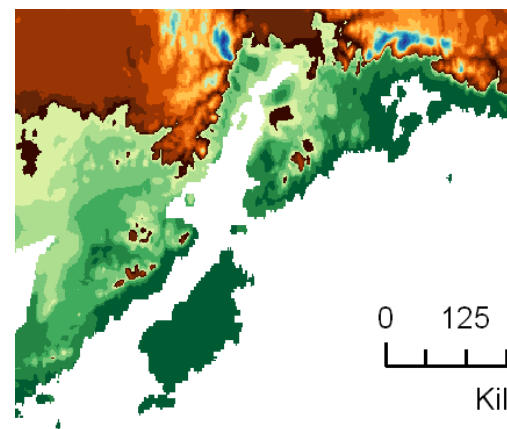
**Length of Growing Season**  
Mid-Range Emissions (A1B)  
2030-2039



**Length of Growing Season**  
Mid-Range Emissions (A1B)  
2060-2069



**Length of Growing Season**  
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2090-2099







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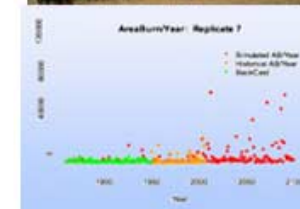
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Click on "Google Earth Maps"



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### Google Earth Maps

You can use Google Earth to explore a wide range of climate projections for the state of Alaska at a 2km resolution. You must install the free Google Earth software on your computer to view these maps.



The following sets of climate maps can be opened in Google Earth. They are combined with descriptive text that can be seen by clicking the links in the sidebar of Google Earth. If you have any troubles, please check our [Google Earth Help](#) page.

→ [Statewide maps by decade and season, thaw and freeze dates, and more](#) (333 bytes)



[Temperature Scenarios: monthly maps 1980-2099](#) (1.6 KB)



[Precipitation Scenarios: monthly maps 1980-2099](#) (1.6 KB)



Click on “Statewide maps by decade and season, thaw and freeze dates, and more”.

ified 5/5/2009

[Presentations](#)

Click “OK” in the dialog box to open the file with Google Earth.

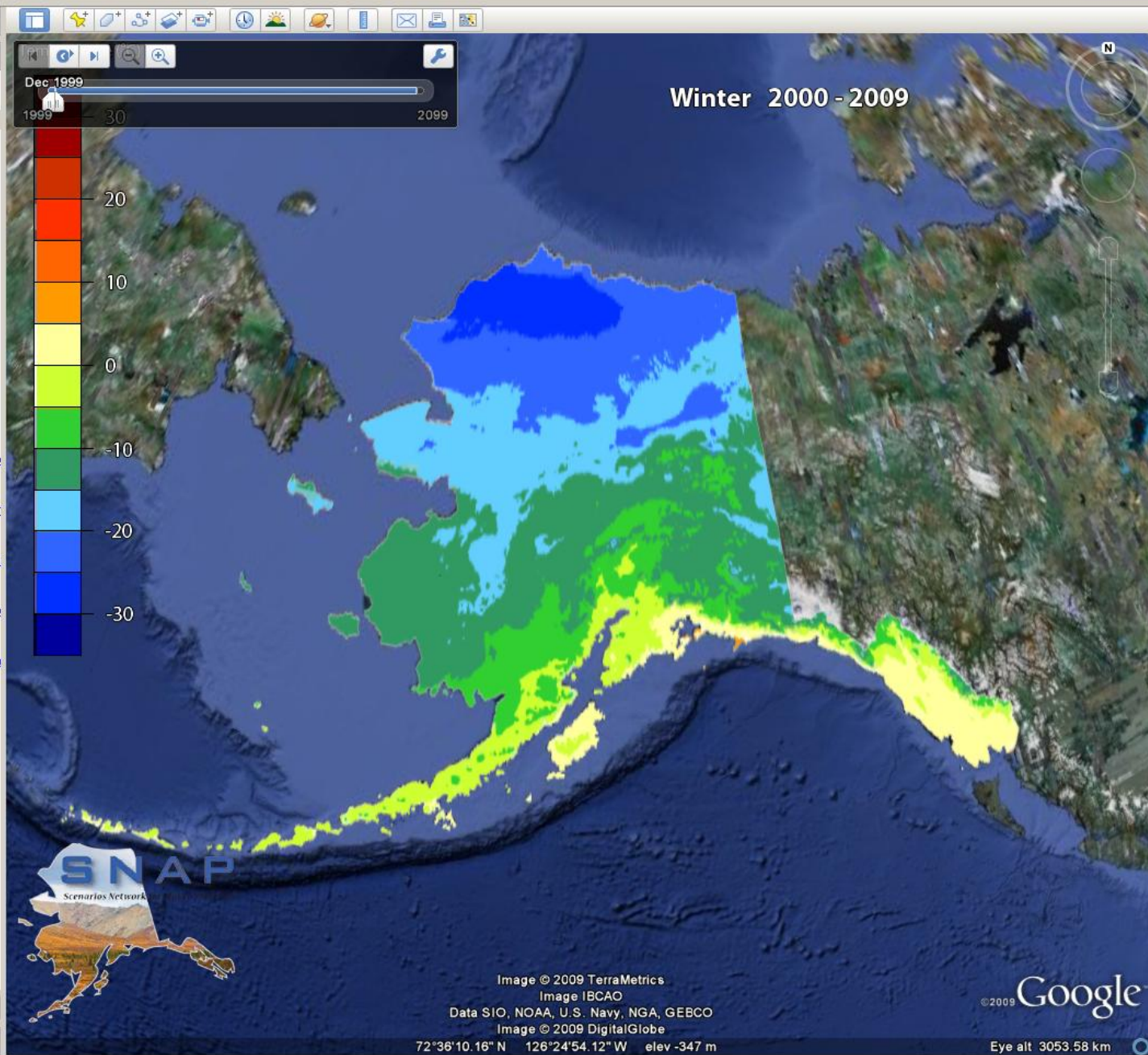
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temperature drops below☒ Date of ThawDate at which mean  
temperature rises above☒ Uncertainty for TemperatureStandard deviation among  
five models☒ Uncertainty for PrecipitationStandard deviation among  
five models☒ Uncertainty for Length of GStandard deviation among  
five models☒ Uncertainty for Date of FreStandard deviation among  
five models☒ Uncertainty for Date of ThaStandard deviation among  
five models

## Layers







Sea ice in Barrow courtesy of Lisa Baraff (left), ACCAP's [Alaska Weather and Climate Highlights](#) Map (center), Post-burn landscape courtesy of Paul Duffy (left).

## Climate Change in Alaska and the Arctic

- [Related ACCAP Webinars](#)
- [Related ACCAP Research Projects](#)
- [State and National Resources](#)

For more details on downloading and viewing  
SNAP Projections and Maps

### Related ACCAP Webinars (*Please see the [archive](#) page for a complete list*)

#### TUTORIAL: USING WEB-BASED AND GOOGLE EARTH MAPS OF PROJECTED CLIMATE CHANGE IN ALASKA

Nancy Fresco, Network Coordinator for Scenarios Network for Alaska Planning and Katie Kennedy, Education and Outreach Coordinator for the University of Alaska Geography Program

The University of Alaska, [Scenarios Network for Alaska Planning](#) (SNAP) provides quick and easy access to a wide range of climate projections for the state of Alaska at a 2km resolution. Data and maps are available for download in web-based and Google Earth formats. These maps show projected changes in temperature, precipitation, growing season length, freeze-up date and thaw date, and include documentation of uncertainties. Learn how to view, interpret and download available data and maps and discuss upcoming SNAP products.

Participants will need to download Google Earth to access the SNAP Google Earth maps. [Click here](#) to download Google Earth.

[Listen to the Podcast of the tutorial](#)

**Presentation/Slides:** [Using web-based and Google Earth maps of projected climate change in Alaska](#)

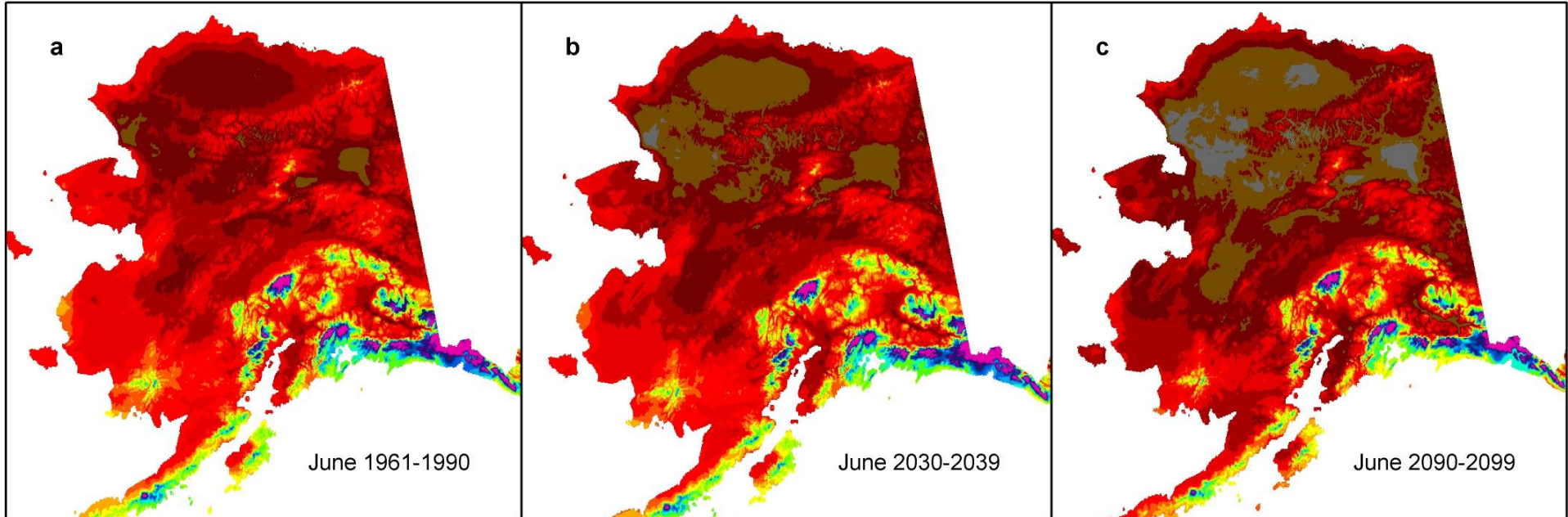
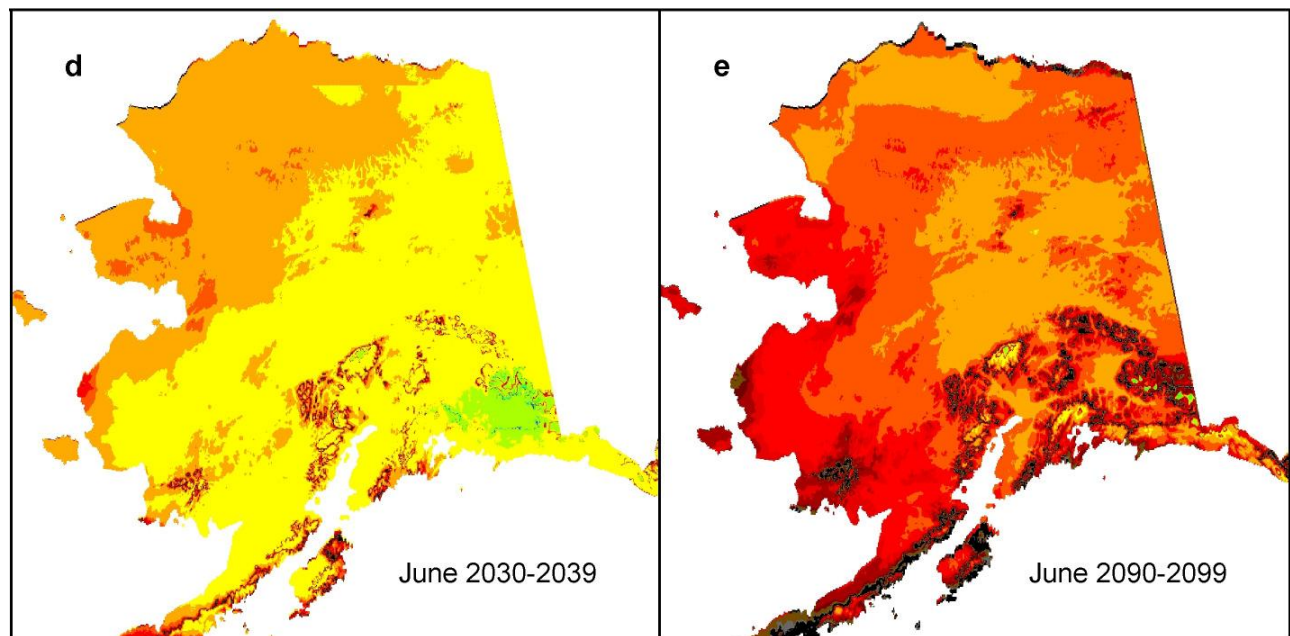
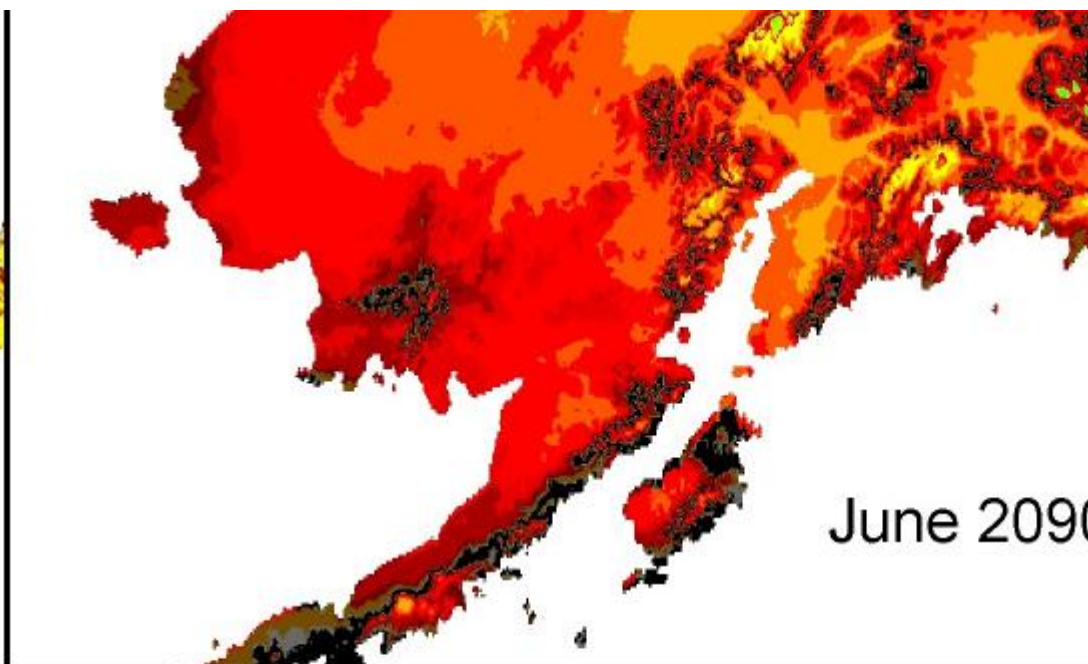
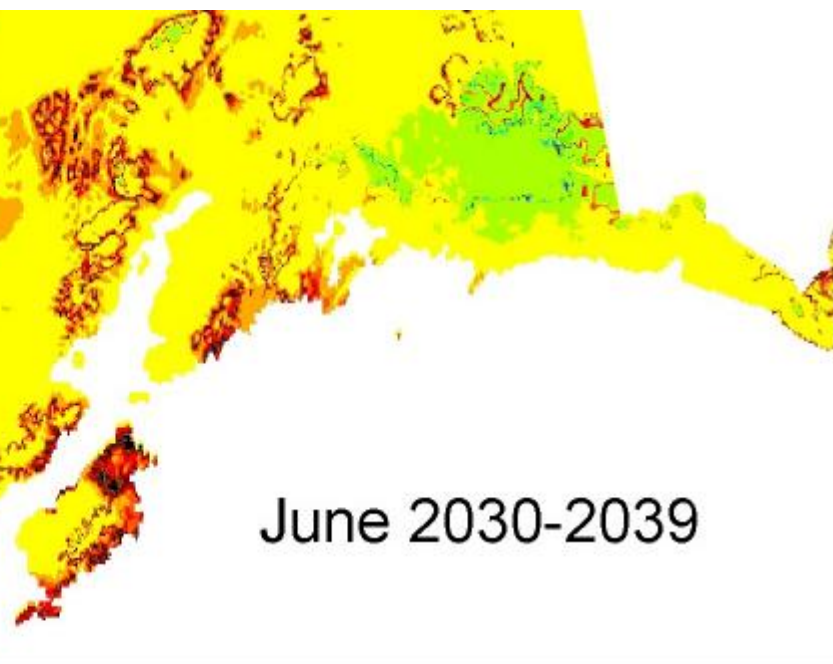


Figure 1. June water availability (P-PET) over the course of the next century (a,b,c).

Percent change in P-PET from historic values (e,f).



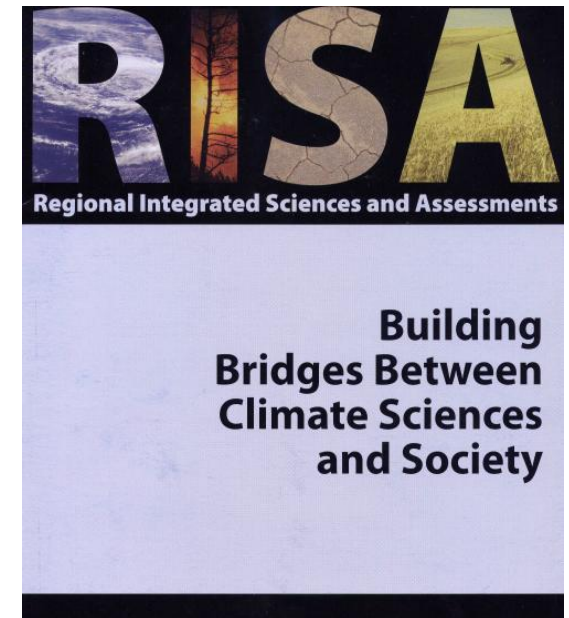
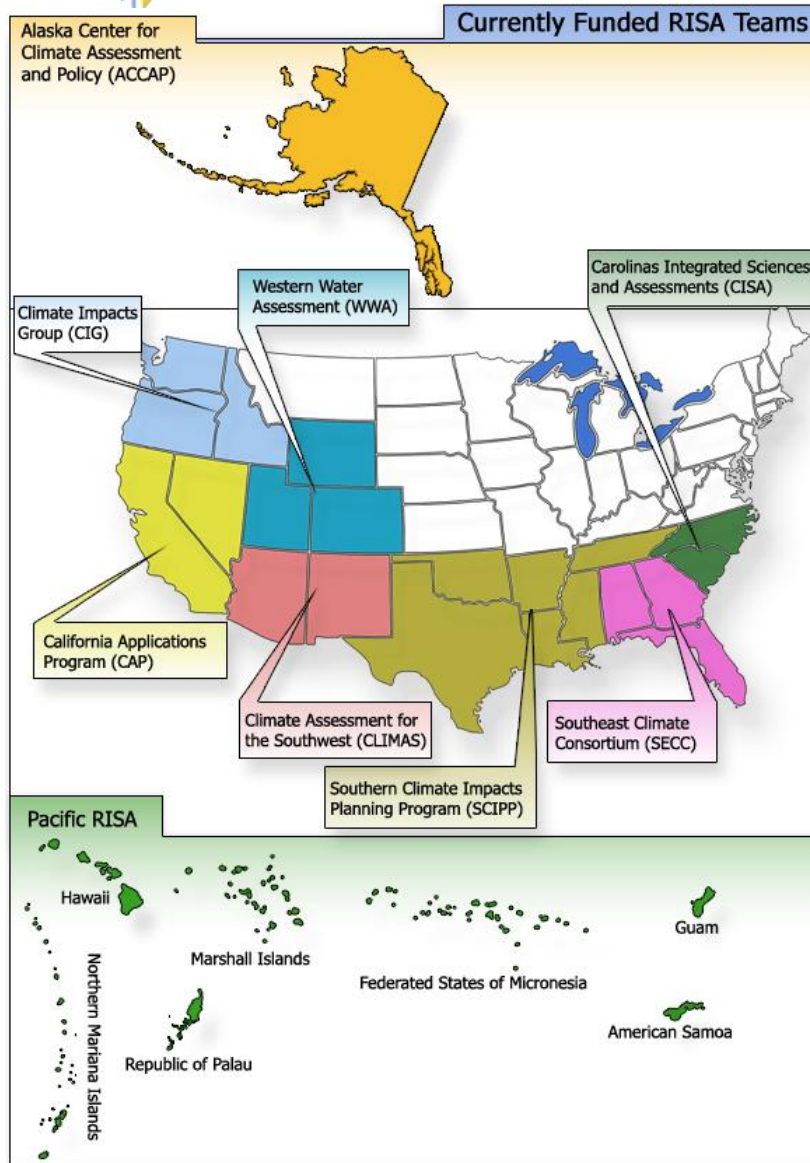






# ACCAP Tools & Resources

How can we improve the  
link between climate  
sciences  
and society?



[http://www.climate.noaa.gov/cpo\\_pa/risa/](http://www.climate.noaa.gov/cpo_pa/risa/)

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**Alaska Center for Climate  
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University of AK Fairbanks  
P.O. Box 755910  
306 Tanana Drive  
Fairbanks, AK 99775-5910



## ACCAP

Alaska Center for  
Climate Assessment & Policy

SEARCH ACCAP:

GO

The mission of the Alaska Center for Climate Assessment and Policy is to assess the socio-economic and biophysical impacts of climate variability in Alaska, make this information available to local and regional decision-makers, and improve the ability of Alaskans to adapt to a changing climate.



Each month ACCAP hosts an [Alaska Climate Teleconference](#) focused on a specific climate related topic. The December, 2007 teleconference focused on the fate of Bering Sea mammals with diminishing sea ice. Diminished sea ice has implications for walrus and ribbon seal populations as well as marine nutrient cycling. [Click here](#) for a teleconference summary.

PAUSE

### \*\* Highlights \*\*

» [Alaska Climate Teleconferences](#)

Next Conference:

**Tuesday, December 8**

**10:00-11am Alaska Local Time**

**CONNECTING ALASKA LANDSCAPES INTO THE FUTURE**

*Nancy Fresco, Scenarios Network for Alaska Planning, and Karen Murphy, US Fish and Wildlife Service*

» [Stakeholder Workshop for Assessment of Climate Change Impacts on Forested Ecosystems of Alaska](#)

An all-day workshop addressing climate change impacts on Alaska's forests was hosted by the [Scenarios Network for Alaska Planning \(SNAP\)](#) and the [USFS Pacific Northwest Research Station](#) on November 5, 2009. The goals of the climate change impacts on forested ecosystems of Alaska project are to review and synthesize existing knowledge, provide a baseline and scenarios of change, and identify data gaps and uncertainties.

The workshop provided an opportunity to engage with the core research team and discuss what issues are important and how they can be addressed so the resulting report is relevant and useful. For more information on how to get involved, including links to the stakeholder survey and workshop evaluation survey, please see the [project website](#).

» NOAA's [2009 Arctic Report Card](#) has been published. Issued annually, the Arctic Report Card is a timely source for clear, reliable and concise environmental information on the state of the Arctic, relative to **3 of 24 - Clipboard**  
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University of AK Fairbanks



SEARCH ACCAP:



Walrus group on "sikupik" courtesy of Gary Hufford (left), King Eider migration along the sea ice edge courtesy of Lisa Baraff (center), USCG Healy in the Bering Sea courtesy of Gary Hufford (right).

## Marine Impacts

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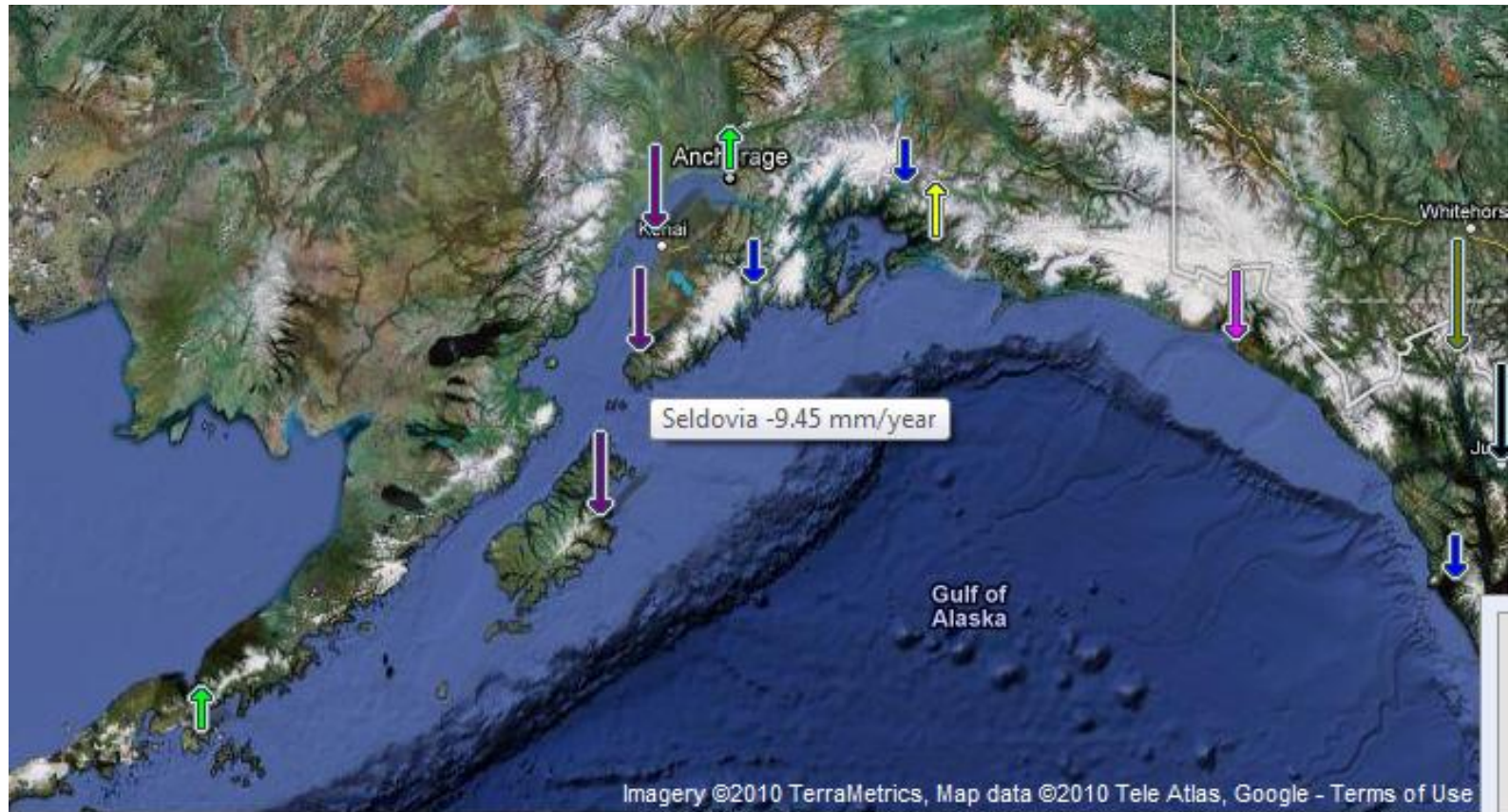
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#### CLIMATE CHANGE AND ALASKA FISHERIES

Mike Sigler, NOAA Alaska Fisheries Science Center, Juneau

Fish harvests in the Arctic Ocean are small, yet the largest U.S. commercial fisheries lie immediately south in the Bering Sea. Some groundfish and crabs have moved northward. This trend is predicted to continue. A large ecosystem study of the Bering Sea aims to understand and forecast these changes. The Bering Sea project is funded by the North Pacific Research Board and the National Science Foundation (<http://bsierp.nprb.org/>). Join us to learn more about climate impacts on Alaska fisheries.

<http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml>



*Illustrates regional trends in sea level, with arrows representing the direction and magnitude of change. Additional information about that station.*

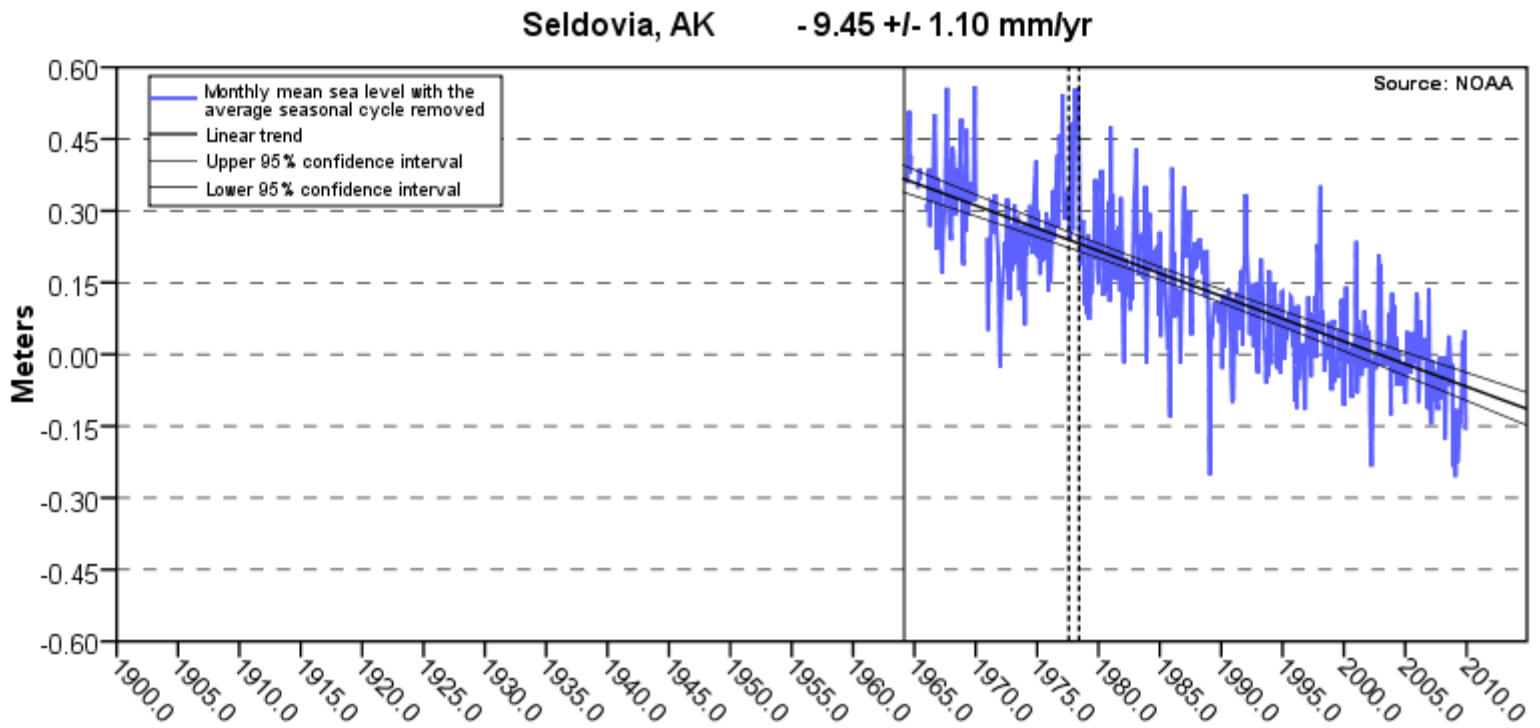


Minimum 30 years of observations

Averaged by month to remove the effect of waves and tides

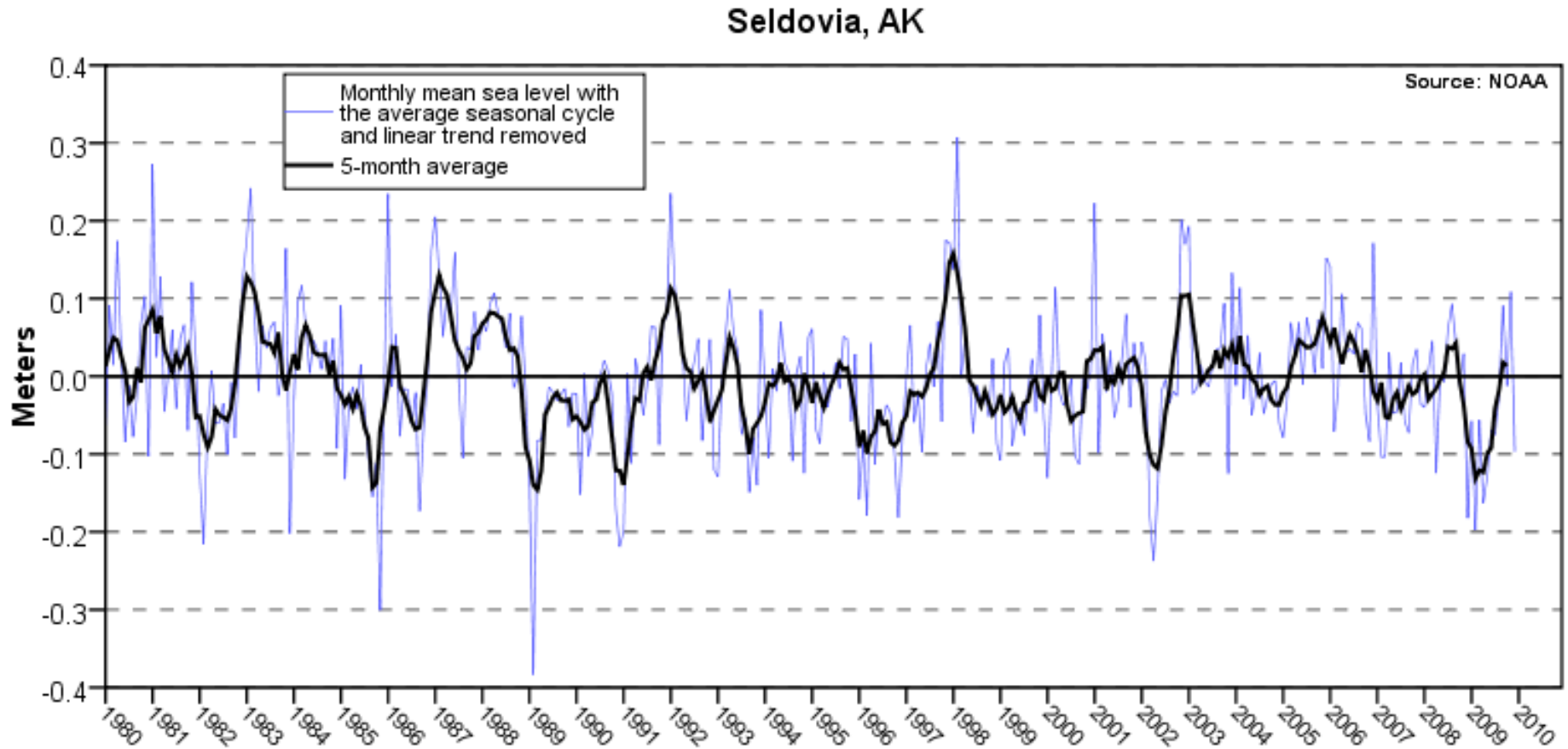


## Mean Sea Level Trend 9455500 Seldovia, Alaska



The mean sea level trend is -9.45 millimeters/year with a 95% confidence interval of +/- 1.10 mm/yr based on monthly mean sea level data from 1964 to 2006 which is equivalent to a change of -3.10 feet in 100 years.

## Interannual variation since 1980 9455500 Seldovia, Alaska



The average seasonal cycle and linear sea level trend have been removed. Interannual variation is caused by irregular fluctuations in coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The interannual variation for many Pacific stations is closely related to the El Niño Southern Oscillation (ENSO).

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Alaska Center for  
Climate Assessment & Policy

SEARCH ACCAP:



Mendenhall Lake in the Tongass National Forest (left) courtesy of the [US Forest Service](#). Forested Communities of Alaska Map (middle) courtesy of [Scenarios Network for Alaska Planning](#). Click [here](#) to view the larger image. Spruce Beetle infested forest (right) courtesy of [UAF Cooperative Extension Service](#).

## Assessing Climate Change Impacts on Forested Ecosystems of Alaska

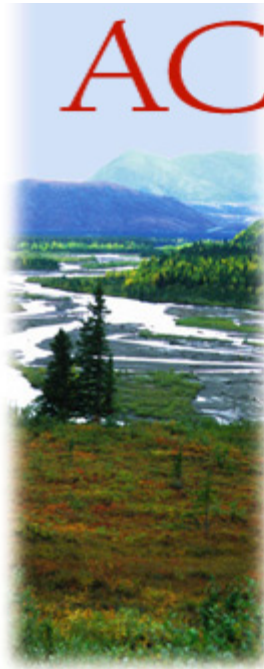
Project:	Assessing Climate Change Impacts on Forested Ecosystems of Alaska
Partners:	<a href="#">USFS Pacific Northwest Research Station</a> , <a href="#">Scenarios Network for Alaska Planning</a>
Primary Scientists:	Teresa Hollingsworth (USFS), T. Scott Rupp (SNAP, UAF), Sarah Trainor (ACCAP/SNAP, UAF)
Funded by:	U.S. Forest Service

- [Project Description](#)
- [Stakeholder Workshop](#)
- [Resources](#)

# Climate Vulnerability & Adaptation Tools & Resources







# ACIA

## Arctic Climate Impact Assessment

An international project of the Arctic Council and the International Arctic Science Committee (IASC), to evaluate and synthesize knowledge on climate variability, climate change, and increased ultraviolet radiation and their consequences. The results of the assessment were released at the ACIA International Scientific Symposium held in Reykjavik, Iceland in November 2004.

The [Arctic Council](#) is a high-level intergovernmental forum. The members are Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the United States of America. [IASC](#) is a non-governmental organization that facilitates cooperation in all aspects of arctic research in all countries engaged in arctic research and in all areas of the arctic region.

The ACIA Secretariat was hosted at the International Arctic Research Center at the University of Alaska Fairbanks. Funding for the Secretariat was provided by the U.S. National Science Foundation and the National Oceanic and Atmospheric Administration.

### ACIA Reports

- [\*Impacts of a Warming Arctic – the 140-page synthesis report of the Arctic Climate Impact Assessment\*](#)
- [Scientific Report](#) - *Downloadable [index](#) now available*
- [Policy Report](#)



The ACIA Policy Document was prepared by the Arctic Council and presented at the Fourth Arctic Council Ministerial Meeting, Reykjavik.



OneNOAA Science Seminar - Silver Spring, MD - 09 September, 2009

# Identifying Key Climate Change Information for Marine and Coastal Ecological Research

*Finding, interpreting, and using the right data*

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NOAA National Climatic Data Center  
<http://www.ncdc.noaa.gov>



Available from Terry Johnson, Paula Cullenberg, or Sarah Trainor



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## "Planning for Climate Change" Workshop

*A customizable workshop for planners and other coastal decision-makers.*

"Planning for Climate Change" was piloted in two locations in March 2009 in Washington State. It was geared primarily toward shoreline planners and developed so that Reserves around the country could customize the workshop and use it as part of their educational efforts regarding climate change. The workshops were well-received by the eighty-five planners who collectively attended, and the planning team felt that the curriculum accomplished the goals of laying a foundation and addressing the question of "Now What?"

If you are with another agency or institution, you are welcome to offer this workshop. **All of the materials, PowerPoint presentations, and streaming video are available here for your use.** We recommend that you think of this workshop as a "roadmap" which can be used in different ways. You can follow the route closely by using these materials, or simply use the materials as a starting point for giving you a general direction. It will be important for you to pull together a team of experts who can highlight the climate impacts expected in your region and speak about local planning issues and case studies.



Facilitation Guidelines  
Workshop Materials  
Evaluation Summaries

- › [Class Description](#)
- › [Class Materials](#)
- › [Binder Contents](#)
- › [Handouts on Resource Table](#)
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[Streaming Video/  
PowerPoint  
Presentations](#)



**International Union for Conservation of Nature**

# The Ocean and Climate Change

Tools and Guidelines for Action

Dorothee Herr and Grantly R. Galland





<http://cses.washington.edu/cig/fpt/planning/guidebook/gateway.php>



## Preparing for Climate Change

### A Guidebook for Local, Regional, and State Governments

#### *Your Feedback on the Guidebook is Important*

We would like to contact guidebook users in the future to assess the guidebook's overall effectiveness in supporting community-based efforts to adapt to climate change. This feedback will help us improve future editions of the guidebook and develop case studies on planning for climate change at the local level. **Involvement in this follow-up survey work is voluntary and is not required for downloading the PDF.**

Can we contact you in the future with questions about how the guidebook has helped your adaptation planning efforts?

- [No thanks, take me to the guidebook PDF](#)
- Yes (enter contact information below)



# suggested checklist for governments on how to prepare for climate change

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## **MILESTONE 1: Initiate your climate resiliency effort (Chapters 4-7)**

- ☐ Scope the climate change impacts to your major sectors (Chapter 4)
- ☐ Pass a resolution or administrative order directing your government to prepare for climate change (Chapter 4)
- ☐ Build and maintain support to prepare for climate change (Chapter 5)
- ☐ Build your climate change preparedness team (Chapter 6)
- ☐ Identify your planning areas relevant to climate change impacts (Chapter 7)

## **MILESTONE 2: Conduct a climate resiliency study (Chapters 8-9)**

- ☐ Conduct a climate change vulnerability assessment (Chapter 8)
- ☐ Conduct a climate change risk assessment (Chapter 9)
- ☐ Prioritize planning areas for action (Chapter 9)

## **MILESTONE 3: Set preparedness goals and develop your preparedness plan (Chapter 10)**

- ☐ Establish a vision and guiding principles for a climate resilient community
- ☐ Set your preparedness goals
- ☐ Develop, select and prioritize your preparedness actions

## **MILESTONE 4: Implement your preparedness plan (Chapter 11)**

- ☐ Ensure that you have the right implementation tools

## **MILESTONE 5: Measure your progress and update your plan (Chapter 12)**

- ☐ Develop and track measures of resilience
- ☐ Update your plan



# Vulnerability Assessment and Adaptation Planning

## Interior Issues Council Climate Change Task Force

**I.C.L.E.I** Local Governments for Sustainability

Fairbanks Economic Development Corporation

Welcome

Interior Issues Council

Projects

All About Fairbanks

About Us

IIC News

### Climate Change Taskforce

#### Steering Committee:

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## Adaptation & Mitigation

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#### Mission

The Interior Issues Council Climate Change Task Force is a group of citizens and public employees collaborating to establish a sustainable climate resilient community through education, public outreach, and borough-wide actions.



## KEENE, NEW HAMPSHIRE

Adapting to Climate Change:  
Planning a Climate Resilient Community

November 2007

Prepared by:



In association with:



Natural Environment

Built Environment

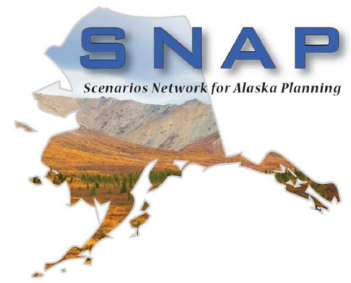
Social Environment

Outreach & Education

Financial



# Impacts



- Public and Private Infrastructure; Facility Administration & Maintenance
- Emergency Response/Preparedness
- Public Health
- Land Use
- Hydrology and Water Resources
- Borough Administration & Intergovernmental
- Tourism & Recreation
- Subsistence
- Other Economic Impacts

- Impacts
- Mechanism
- Data Needed
- Suggested Planning Actions





# Potential Opportunities



- Fire fighting employment
- Expanded construction season
- Possible increase in agricultural production
- Opportunities
- Mechanism
- Data Needed
- Suggested Planning Action



# Collaborating with Alaska Sea Grant on Coastal Community Adaptation





# Thank You





# Contact Us



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